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SUBGENERIC GROUPS OF HEMISIA (HYMENOPTERA, APOIDEA)

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It has often been noted that the large American genus of bees usually known as **Centris** but unfortunately properly called **Hemisia** (see Sandhouse, 1943, and Michener, 1944) contains a number of rather different elements. Placement of these elements in separate genera (see Moure, 1945) tends to obscure their obvious relationships to one another but the recognition of groups within **Hemisia** is nonetheless desirable. Friese (1900) divided the 159 species then known into four subgenera and twenty-five groups. Unfortunately, his subgenera and groups were separated by color and were to a large extent unnatural assemblages of species. The present paper is an atempt to provide a natural classification for the whole genus.

The genus **Hemisia** is restricted to the Western Hemisphere. Most of the species are found in the moist tropics but some occur in Chile and arid parts of Argentina while others are found in the arid highlands of the Mexican plateau and the southwestern United States. In this country the genus occurs only in southern Florida and in the southwest from Texas to California and north to southern Utah.

It is interesting that the subgenera which are here considered most primitive **(Wagenknechtia, Penthemisia)** are largely confined to the more arid parts of the range of **Hemisia.** This fact might be interpreted in several ways but since bees in general are more abundant and diversified in arid areas and numerous groups are found only in such areas or show clear evidence of having originated in such areas, it seems worth suggesting that **Hemisia** may have originated in an arid area and only later invaded the moist tropics.

Wagenknechtia may well be near the ancestral type from which the other subgenera arose. From it one line of development leads (by acquisition of the giant branched seatae of the male genitalia and other characters) to **Penthemisia,** from which two phyletic lines lead to **Xanthemisia,** and to **Hemisia** s. str. Perhaps also from **Wagenknechtia** (although the relationship is less close) lead the lines to the two remaining groups of subgenera (1, **Hemisiella, Trachina,** and **Heterocentris** and 2, **Ptilotopus** and **Melanocentris).**

It will be observed that in certain of the subgeneric descriptions exceptions to general statements are noted, usually in parentheses. For example, **H. pallida** differs by certain rather striking characters from other species of **Penthemisia.** Nonetheless it is clearly closely related to the other species of the subgenus and runs to **Penthemisia** without difficulty in the accompanying key. It is therefore retained in **Penthemisia** because the primary function of categories above the species level should be to indicate relationships, not to emphasize minor differences.

Key to the Subgenera of Hemisia

1. Maxillary palpi three-segmented; posterior legs of males swollen, hind basitarsi usually with spine on inner surface of each 2
   Maxillary palpi four- or five-segmented; posterior legs of male not swollen, basitarsi without inner spines. 4
2. Male with seventh metasomal sternum with apical process much reduced so that sternum is little more than transverse band; female with distinct secondary basitibial plate separated from primary one by transverse line; both sexes with longitudinal yellow line on clypeus, sometimes largely incorporated into yellow of rest of clypeus. ..... **Trachina**
   Male with large apical processes on seventh and eighth sterna; female without distinct secondary tibial plate; clypeus without longitudinal yellow line. 3
3. Male with second mandibular tooth larger than third and closer to third than first; female with inner upper mandibular carina elevated basally and labrum variably modified. ..... **Heterocentris**
   Male with second mandibular tooth smaller than third and associated with first; female with inner upper mandibular carina simple or elevated at apex, labrum normal. ..... **Hemisiella**
4. Females 5
   Males 9
5. Secondary basitibial plate with distinct overhanging margin. 6
   Secondary basitibial plate with margin not overhanging, at least at lower end. 7
6. Large forms with abdomen non-metallic; scutellum usually bilobed; upper inner mandibular carina ending near next to innermost apical tooth; mandibles broadened subapically. ..... **Melanocentris**
   Usually smaller forms with abdomen usually at least faintly metallic; scutellum not bilobed; upper inner mandibles carina ending near innermost apical tooth; mandibles slender. ..... **Hemisia**
7. Scutellum bilobed with well defined bare areas; very large species. ..... **Ptilotopus**
   Scutellum not bilobed, without bare areas; smaller species. 8
8. Mandibles with distinct tooth on under surface near base of first apical tooth. ..... **Xanthemisia**
   Mandibles without tooth on under surface. ..... **Wagenknechtia** and **Penthemisia**
9. Genitalia with giant branched setae arising from gonocoxites near bases of gonostyli. 10
   Genitalia without giant branched setae. 12
10. Giant branched setae scattered along inner margins of apical stylus-like projections of gonocoxites; abdomen ordinarily at least feebly metallic. ..... **Hemisia**
    Giant branched setae restricted to regions near bases of gonostyli, there being no apical projections of gonocoxites; abdomen usually not metallic. 11

11. Male gonostyli much broadened in a vertical plane; maxillary palpi four-segmented; first flagellar segment much longer than scape. ..... **Xanthemisia**
Male gonostyli not broadened; maxillary palpi clearly five-segmented; first flagellar segment usually not much longer than scape. **Penthemisia**

12. Moderate sized species with scutellum not bilobed; maxillary palpi clearly five-segmented. ..... **Wagenknechtia**
Large species with scutellum usually bilobed; maxillary palpi four-segmented, fourth segment sometimes apparently feebly subdivided. ..13

13. Hypoepimeral area with tubercle. ..... **Ptilotopus**
Hypoepimeral area without tubercle. ..... **Melanocentris**

Subgenus **Wagenknechtia** Moure

Wagenknechtia Moure, 1950, Dusênia, vol. 1, p. 389 (type: **cineraria;** this is the **chilensis** of Friese, nec Spinola)

This subgenus is a close relative of **Penthemisia,** having similar mandibular structure. It differs most strikingly in the absence of large plumose hairs on the male genitalia. There is not the tendency toward a short first flagellar segment found in **Penthemisia.** The abdomen is either black **(muralis)** or metallic blue **(cineraria),** without yellow markings. There are no pale face markings in either sex.

Mandibles rather slender, inner tooth small, acute or obtuse, those of female with four apical teeth (second one very weak in **muralis);** upper inner carina ending near basal one of these teeth; those of male with three apical teeth (third bidentate in **muralis);** maxillary palpi five-segmented, last two segments together longer than first and well differentiated from one another; ocelli near narrowest part of vertex, lateral ocelli of male separated from eye margin by more than ocellar diameter; first flagellar segment of male as long as in **Hemisia** proper; mesonotum without bare areas; fore basitarsi of female without large spatulate setae or with only a few at apex in direct continuation of the usual row of heavy setae; basitibial plate of female without secondary plate; first recurrent vein entering second submarginal cell beyond basal third; seventh and eighth metasomal sterna of male with apical processes slender; gonocoxites drawn out apically and bearing at their tips the short gonostyli, large branched setae absent.

This subgenus appears to be confined to southern South America. It contains **H. cineraria** (Smith), **muralis** (Burmeister), **orellanai** Ruiz, and **rhodophthalma** Pérez.

Subgenus **Penthemisia** Moure

Penthemisia Moure, 1950, Dusênia, vol. 1, p. 390 (type: **chilensis** Spinola =**smithii Friese**=**bicolorella** Cockerell)

This subgenus is closely related to **Hemisia** proper, having similar mandibular structure, but differs in the male genital structure, the female basitibial plates, in the absence of metallic coloration and of yellow abdominal markings and other characters. The abdomen is usually black but sometimes red **(tricolor).** The clypeus may be black in both sexes, red in the female, or

black with central yellow spot in the female, or entirely yellow in the male; the paraocular areas are black.

Mandibles rather slender, inner tooth small, usually acute but very feeble and obtuse in **hoffmanseggiae** and **pallida,** those of female with three **(pallida)** or usually four apical teeth, upper inner carina ending near basal one of these teeth, those of male with three apical teeth; maxillary palpi five-segmented, last two segments together usually longer than the first and well differentiated from one another; ocelli near narrowest part of vertex, lateral ocelli of male separated from eye margin by more than an ocellar diameter; first flagellar segment of male sometimes **(mexicana)** as long as in **Hemisia** proper but usually shorter, often only as long as scape; mesonotum without definite bare areas; fore basitarsi of female without large spatulate setae and often without the usual ventral row of coarse setae; basitibial plate of female nearly plane or with a secondary plate, the latter not overhanging but with its surface merging into that of primary plate at least apically (secondary plate best defined in **mexicana**); first recurrent vein entering second submarginal cell usually beyond basal third; seventh and eighth metasomal sterna of the male with apical processes slender; gonostyli shorter than in **Hemisia** proper; gonocoxites without apical processes, large branched setae arising in a group near base of each gonostylus.

This subgenus extends farther north and perhaps farther south than any other subgenus but is not well represented in the moist tropics. There are rather numerous species in the deserts of both North and South America. Included species are: **H. agilis** (Smith), **aterrima** (Smith), **atripes** (Mocsáry), **autrani** (Vachal), **birkmanni** (Friese), **buchholzi** (Herbst), **caesalpiniae** (Cockerell), **californica** (Timberlake), **chilensis** (Spinola), **cockerelli** (Fox), **garleppi** (Schrottky), **hoffmanseggiae** (Cockerell), **klugi** (Friese), **lanosa** (Cresson), **mixta** (Friese), **nigerrima** (Spinola), **pallida** (Fox), **rhodoleuca** (Cockerell), **rhodomelas** (Timberlake), **rhodopus** (Cockerell), **tiburonensis** (Cockerell), and **tricolor** (Friese).

The length of the first flagellar segment of the male is variable, being long as usual in **Hemisia** in most of the Chilean species and in **mexicana** but much shorter in most North American species. Since intermediates exist and no other characters correlated with this one have been found, it seems desirable to place both the North American and the South American species in a single subgenus.

Subgenus **Hemisia** Klug

Hemisia Klug, 1807, Mag. Insektenkunde, vol. 6, p. 227 (type: **haemorrhoidalis**)
Cyanocentris Friese, 1900, Ann. K.K. Naturhist. Hofmus. (Wien), vol. 15, p. 224 (type: **versicolor**)
Poecilocentris Friese, 1900 Ann. K.K. Naturhist. Hofmus. (Wien), vol. 15, p. 244 (type: **fasciatella**)

This subgenus consists of moderate sized to rather large species, usually with the abdomen having at least a little metallic blue or green coloration, often with a broken yellow band on the second metasomal tergum and sometimes with yellow bands on several terga **(Poecilocentris)**. The background color of the abdomen is usually dark but sometimes red (eg. **inermis**).

In the female there is usually a transverse yellow band near the lower margin of the clypeus with an upward median extension, this marking sometimes reduced to lower lateral spots and a median streak. The paraocular areas in both sexes are partly yellow. In the male the clypeus is largely yellow but the upper lateral margins are black .

Mandibles rather slender, inner tooth small but acute, those of female with three **(fasciatella** and **smithii)** or usually four apical teeth, upper inner carina ending near basal one of these teeth; of male with three apical teeth, the basal one of which is sometimes **(nitens** and **decolorata)** bidentate; maxillary palpi five-segmented, last two segments together about as long as first and frequently partially fused; ocelli near narrowest part of vertex, lateral ocelli of male separated from eye margin by ocellar diameter or more; first flagellar segment longer than scape; mesonotum without definite bare areas; fore basitarsi of female usually with large spatulate setae on lower outer margin (except in **smithii**); basitabial plate of female with clearly defined secondary plate the margins of which overhang primary plate; first recurrent vein entering second submarginal cell near basal third; seventh and eighth metasomal sterna of male with apical processes slender; gonostyli rather long and slender; gonocoxites each bearing an apical process above gonostylus, this process bearing numerous large branched setae along inner margin.

This is a large subgenus. It is the only subgenus other than **Penthemisia** which reaches the United States. In this country it is known only in southern Florida. It contains **Hemisia aenea** (Lepeletier), **apicalis** (Smith), **buckwaldi** (Friese), **caxiensis** (Ducke), **decolorata** (Lepeletier), **fasciata** (Smith), **fasciatella** (Friese), **flavifrons** (Fabricius), **heamorrhoidalis** (Fabricius), **inermis** (Friese), **minor** (Friese), **nigrofasciata** (Friese), **nitens** (Lepeletier), **obscuriventris** (Friese), **poecila** (Lepeletier), **smithii** (Cresson), **varia** Erichson, and **versicolor** (Fabricius).

It probably includes all of the species which Friese placed in **Poecilcentris** and most of those which he placed in **Cyanocentris.**

Subgenus **Xanthemisia** Moure

?**Paracentris** Cameron, 1903, Trans. Amer. Ent. Soc., vol. 29, p. 235 (type: **fulvohirta** Cameron)

Xanthemisia Moure, 1945, Rev. Ent., vol. 16, p. 401 (type: **bicolor**)

This very distinctive small subgenus is another one of the group of subgenera to which **Hemisia** proper belongs but differs strikingly in the mandibular structure of the female. The male genitalia are more like those of **Penthemisia,** from which **Xanthemisia** differs in mandibular structure and a variety of other characters. The abdomen is black or red **(rubella),** not metallic. The clypeus of the female is black or with lower lateral areas pale yellow (in **rubella**); the clypeus of the male is largely yellow. Paraocular areas are without yellow markings in both sexes.

Mandibles rather slender, inner tooth small (absent in male **lutea**), those of female with four apical teeth, second not in line with others but elevated (third truncate, almost bidentate, in **rubella**); under surface of mandible of female with a short transverse ridge connected with fourth tooth and a

separate small tooth beneath first tooth; upper inner mandibular carina ending at a point near bases of third and fourth teeth; mandibles of male with three apical teeth, upper carina ending near third; first flagellar segment long; mesonotum without bare areas; fore tarsi of female with large spatulate setae as in **Hemisia** proper; basitibial plate of female with secondary plate almost as close to anterior as to posterior margins of primary plate, margins of secondary plate not overhanging but sloping down to level of primary plate; first recurrent vein entering second submarginal cell just beyond basal third; seventh metasomal sternum of male with apical process slender, eighth with apical process long but rather broad; male genitalia unusually small, gonostyli rather short, broadened in a vertical plane; large branched setae arising from gonocoxites near bases of gonostyli; gonocoxites without apical processes.

This subgenus contains **Hemisia bicolor** (Lepeletier), **lutea** (Friese), and **rubella** (Smith).

Subgenus **Heterocentris** Cockerell

Gundlachia Cresson (not Pfeiffer), 1865, Proc. Ent. Soc. Philadelphia, vol. 4, p. 195 (type: **cornuta** Cresson=**difformis**)
Heterocentris Cockerell, 1899, Entomologist, vol. 32, p. 14 (type: **cornuta=difformis**)
Rhodocentris Friese, 1900, Ann. K.K. Naturhist. Hofmus. (Wien), vol. 15, p. 244 (type: **cornuta=difformis**)

This subgenus is related to **Trachina** and **Hemisiella** but differs in the absence of an inner mandibular tooth in the male, in having the second mandibular tooth of the male more closely associated with the third than with the first, in the modified lower inner mandibular carina of the female, and in the shape of the seventh metasomal sternum of the male. The abdomen is red or black, not metallic. The paraocular areas are black in both sexes. The clypeus in the female has a yellow area near the lower margin at each side, these areas sometimes nearly united medially to form a subapical band; the clypeus of the male is yellow except for the upper lateral margins.

Trachina, Heterocentris, and **Hemisiella** might well be united into a single subgenus. The following description is based on **H. minuta** and **labrosa,** the genotype being unavailable to me. The association of these species with the genotype is based on the conclusions of Moure (1945).

Mandibles rather slender, inner tooth absent, upper inner carina of female strongly elevated; mandible of female with three apical teeth, second smaller than third and frequently reduced to a convexity on inner margin of first, upper inner carina ending near third tooth; mandible of male with three apical teeth, second larger than third, second and third closely associated; labrum large and modified; maxillary palpi three-segmented; ocelli near narrowest part of vertex, separated from eye margin by more than ocellar diameter; first flagellar segment of male longer than scape; mesonotum without bare areas; fore tarsi of female with a few, large, spatulate setae; basitibial plate of female without distinct secondary plate; hind legs of male swollen; first recurrent vein entering second submarginal cell near basal third; seventh metasomal sternum of male with apical process as broad as or broader than long, eighth with long but broad apical process; gonostyli rather short, gonocoxites without apical processes, large branched

setae absent from male genitalia; fourth and fifth sterna of female with some coarse and frequently hooked bristles arising near bases of hair bands.

This subgenus contains the species **Hemisia bicornuta** (Mocsáry), **difformis** (Smith), **labrosa** (Friese), **minuta** (Mocsáry) and their allies.

Subgenus **Trachina** Klug

Trachina Klug, 1807, Mag. Insektenkunde, vol. 6, p. 226 (type: **longimana**)
Paremisia Moure, 1945, Rev. Ent., vol. 16, p. 406 (type: **lineolata**)

This subgenus differs from **Heterocentris** by the very short seventh metasomal sternum of the male, the presence of an inner mandibular tooth in both sexes, the association of the second mandibular tooth with the first rather than the third tooth, the division of the basitibial plate of the female by a transverse line into an elevated secondary plate and a lower primary plate, and other characters. The abdomen is red, non-metallic. The face markings are similar in the two sexes although the yellow is more extensive in the male. The paraocular areas are partly yellow; the clypeus has a longitudinal median yellow line connecting with a transverse subapical yellow band, the latter enlarged laterally and sometimes extending upward so that in some males the clypeus is yellow except for two black spots near its upper margin, one on either side of the median line.

Mandibles rather slender, inner tooth small, frequently acute, those of female with three apical teeth, second small and closely associated with first, third larger than second and sometimes **(longimana, proxima)** bifid, upper inner carina ending near third tooth (apex of this carina forming small tooth in **longimana**); mandibles of male with three apical teeth, third tooth shorter than second, broad and biangulate, (second tooth absent in **longimana**), upper inner carina ending near distal angle of third tooth; maxillary palpi three-segmented; ocelli slightly in front of narrowest part of vertex, lateral ocelli of male separated from eye margin by less than to more than ocellar diameter; first flagellar segment of male long; mesonotum without bare areas; fore basitarsi of female with few large spatulate setae; basitibial plate of female with basal half elevated as a secondary plate separated from distal half by transverse line; hind legs of male swollen; first recurrent vein entering second submarginal cell slightly before basal third; seventh metasomal sternum of male virtually without apical process, eighth with long apical process; gonostyli rather short, gonocoxites without apical processes, large branched setae absent from genitalia.

This subgenus contains **Hemisia dentata** (Smith), **fuscata** (Lepeletier), **lineolata** (Lepeletier), **longimana** (Fabricius), and probably **pachysoma** (Cockerell) and others.

Subgenus **Hemisiella** Moure

Hemisiella Moure, 1945, Rev. Ent., vol. 16, p. 407 (type: **lanipes**)

This is a rather large subgenus which can be recognized in both sexes by having the third mandibular tooth larger than the second, which is sometimes absent, the basitibial plate of the female without a distinct secondary plate, and the apical processes of both the seventh and eighth metasomal sterna of the male broad and rather short. The abdomen is red, less commonly black **(nitida, facialis)**, non-metallic. In both sexes the paraocular

areas are marked with yellow. The clypeus of the female bears a subapical yellow band, frequently broken medially, while that of the male bears a similar but broader band which may occupy much of the clypeus.

Mandibles rather slender, inner tooth small and usually acute, those of female with two or three apical teeth, third tooth much larger than second when three are present (except in **nitida**), second, in this case, closely associated with first tooth, inner upper mandibular carina ending near most proximal of apical teeth; mandibles of male with three apical teeth, second tooth much smaller than third and associated with first tooth; maxillary palpi three-segmented; ocelli near narrowest part of vertex, lateral ocelli of male separated from eye margin by more than ocellar diameter; first flagellar segment of male long; mesonotum without bare areas; fore basitarsi of female with large spatulate setae; basitibial plate of female without secondary plate; hind legs of male swollen; first recurrent vein entering second submarginal cell near basal third or fourth; seventh metasomal sternum of male with apical process about as broad as long, eighth with apical process varying from the same proportions to nearly twice as broad as long; gonostyli short; gonocoxites without apical processes, genitalia without large branched setae.

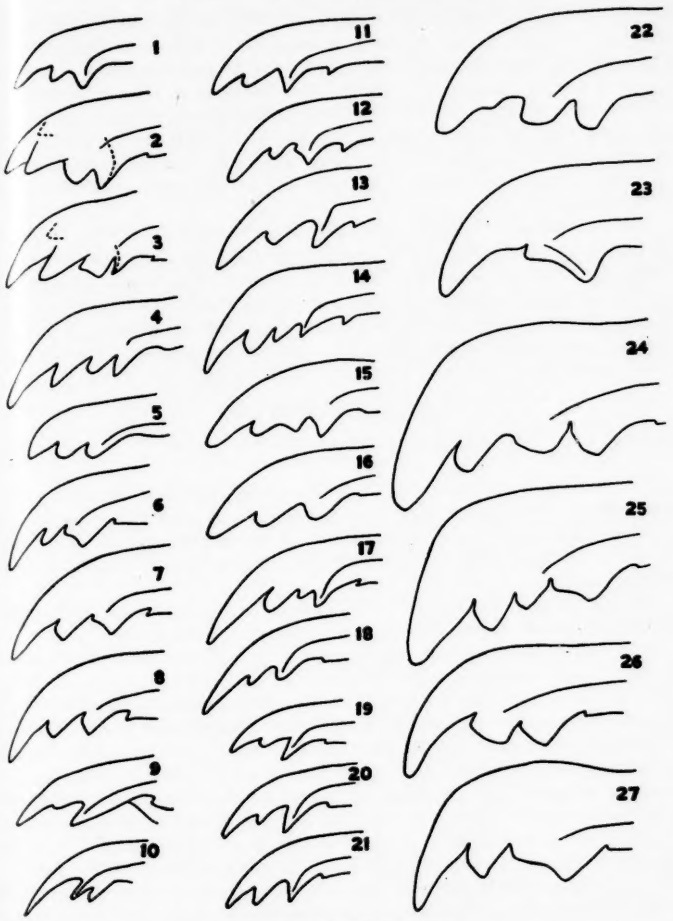
This subgenus includes **Hemisia dichrootricha** (Moure), **facialis** (Mocsáry), **geminata** (Cockerell), **hoplopoda** (Moure), **lanipes** (Fabricius), **nigriventris** (Burmeister), **nitida** (Smith), **tarsata** (Smith), **tranversa** (Pérez), **vittata** (Lepeletier), and doubtless others.

Subgenus **Melanocentris** Friese

Melanocentris Friese, 1900, Ann. K.K. Naturhist. Hofmus. (Wien), vol. 15, p. 241, (type: **atra**).

This subgenus is related to **Ptilotopus,** consisting, like **Ptilotopus,** of very large bees. It differs from **Ptilotopus** in the absence of well defined, finely punctured, bare areas on the mesonotum, the presence of four large apical mandibular teeth in the female, the presence of a secondary basitibial plate in the female, and the absence of a hypoepimeral tubercle. The abdomen is black or red, not metallic. The face of the female is entirely black or with yellow on the paraocular areas alone or with yellow on these areas and also on a broad subapical clypeal band. In the male the paraocular areas are partly yellow or yellowish brown and the clypeus is largely similarly colored (rarely with yellow reduced to a narrow transverse band).

Mandibles broader subapically than medially, outer margins strongly convex subapically, teeth directed more nearly at right angles to mandibular axis than in other subgenera; inner tooth small, sometimes acute; female with four large apical teeth (fourth bidentate in **flavilabris**), male with three large apical teeth (third bidentate in **flavilabris**); upper inner mandibular carina ending near base of third tooth in females, second in males (except in male **flavilabris** where it ends near distal angle of third tooth); maxillary palpi four-segmented, fourth segment very short to about as long as first segment, in the latter case sometimes weakly divided so that palpi might be considered five-segmented; ocelli slightly in front of narrowest part of vertex, lateral ocellus of male separated by an ocellar diameter or less from eye margin; first flagellar segment of male long; mesonotum without well



EXPLANATION OF FIGURES

Mandibles of: 1, **Hemisia lutea,** ♂; 2, same, ♀; 3, **H. rubella,** ♀; 4, **H. cineraria,** ♀; 5, same, ♂; 6, **H. fuscata,** ♂; 7, **H. proxima,** ♀; 8, **H. fuscata,** ♀; 9, **H. minuta,** ♀; 10, same, ♂; 11, **H. haemorrhoidalis,** ♂; 12, **H. decolorata,** ♂; 13, **H. fasciatella,** ♀; 14, **H. haemorrhoidalis,** ♀; 15, **H. hoffmanseggiae,** ♀; 16, **H. pallida,** ♀; 17, **H. rhodopus,** ♀; 18, same, ♂; 19, **H. lanipes,** ♂; 20, **H. facialis,** ♂; 21, **H. nitida,** ♀; 22, **H. americana,** ♀; 23, same, ♂; 24, **H. atriventris,** ♀; 25, **H. flavilabris,** ♀; 26, **H. atriventris,** ♂; 27, **H. flavilabris,** ♂.

Figures 1-3 are **Xanthenisia;** 4-5, **Wagenknechtia;** 6-8, **Trachina;** 9-10, **Heterocentris;** 11-14, **Hemisia** s. str.; 15-18, **Penthemisia;** 19-21, **Hemisiella;** 22-23, **Ptilotopus;** 24-27, **Melanocentris.**

defined bare areas although scutellum is formed into two rounded lobes the summits of which may be partially exposed; fore basitarsi of females with large spatulate setae; basitibial plate with well defined secondary plate having overhanging margins, secondary plate like that of **Hemisia** proper in structure and position; first recurrent vein entering second submarginal cell near basal third; seventh metasomal sternum with apical process about twice as long as broad, eighth with long but rather broad process; gonostyli of moderate length; gonocoxites without apical processes, without large branched setae.

This subgenus includes **H. atra** (Friese), **atriventris** (Mocsáry), **boliviensis** (Friese), **collaris** (Lepeletier), **conspersa** (Mocsáry), **discolor** (Smith), **dorsata** (Lepeletier), **flavilabris** (Friese), **furcata** (Fabricius), **fusciventris** (Mocsáry), **insignis** (Smith), **mariae** (Mocsáry), **mocsaryi** (Friese), **obsoleta** (Lepeletier), **pectoralis** (Burmeister), **poçograndensis** (Schrottky), **rufohirta** (Friese), and **xanthocnemis** (Perty). Several species are included in this list, and a few in other lists as well, on the strength of Moure (1950).

Subgenus **Ptilotopus** Klug

Ptilotopus Klug, 1810, Mag. Gesellsch. Naturf. Freunde Berlin, vol. 4, p. 31, (type: **americana**).

This subgenus contains the largest species of **Hemisia.** Distinctive features are the large tubercle on the anterior lower portion of the hypoepimeral area and the clearly defined bare areas on the mesoscutellum and usually also on the mesoscutum. The abdomen is black, nonmetallic, and the face in both sexes is black.

Mandibles thick but not subapically broadened as in **Melanocentris,** inner mandibular tooth absent (unless it is enlarged to form what is here called a third apical tooth); female with three apical teeth and sometimes **(americana)** a slight convexity on inner margin of first tooth, upper inner carina ending near second tooth; male (available only in **americana**) with three apical teeth, second and third connected by shallow concavity; maxillary palpi four-segmented, last segment about as long as first; ocelli of male separated from eye margin by more than ocellar diameter; first flagellar segment of male long; mesoscutum (except in **americana**) with clearly defined bare areas; axillae and mesoscutellum with similar areas at least in females; scutellum bilobed, females with upper surface of each lobe rather flat; fore basitarsi of female with large spatulate setae; basitibial plate of female without clearly defined secondary plate; first recurrent vein entering second submarginal cell at basal third; seventh and eighth metasomal sterna of male each with rather broad and long apical process; gonostyli of moderate length; gonocoxites without apical processes and large branched setae.

This subgenus includes **H. americana** (Klug), **denudans** (Lepeletier), **derasa** (Lepeletier), **maranhensis** (Ducke), **moerens** (Perty), **nobilis** (Westwood), **scopipes** (Friese), **singularis** (Ducke), **sponsa** (Smith), and **superba** (Ducke).

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Note

Dr. C. Andresen Hubbard of the Vanport Extension Center, Portland, Oregon, has presented to the Snow Entomological Museum, University of Kansas, a representative collection of fleas of the Pacific Northwest. For similar collections Dr. Hubbard has designated nineteen other depositories located in the United States, England, Brazil, India, Canada and Russia. Dr. Hubbard is the author of "Fleas of Western North America" (1947) and has published numerous articles on North American Siphonaptera.

R. H. BEAMER, Curator.

SOME SPECIES OF DELPHACODES, NEW AND OLD (Homoptera-Fulgoridae-Delphacinae)

R. H. BEAMER
University of Kansas, Lawrence

Delphacodes megadonta n. sp.

Brachypterous form:

Resembling **Delphacodes peneparvula** Bmr. but male anal segment with a pair of heavy broad black processes instead of none. Length ♂ 2.0 mm.; ♀ 2.2 mm.

Structure: Front slightly more than twice as long as greatest width, widest near apical third, slightly narrowed toward apex, much more so toward base, distinctly tricarinate; crown distinctly longer than width at base, apex narrower than base, rounded, carinae indistinct, stronger on base; elytra about twice as long as wide, semihyaline, veins raised, apices rounded.

Color: General color stramineous; dorsum of abdomen usually with an indication of four longitudinal darker lines; male styles and anal hooks almost black.

Genitalia: In lateral view: pygofer almost rectangular, posterior margin broadly excavated, dorsal margin broadly rounded; anal segment with posterior margin extended into a pair of very broad, long, curving processes; aedeagus almost straight, thickened on ventral margin near middle, a large flange-like tooth or process on left side of outer third, outer half of dorsal margin with a row of short retrorse teeth, a row of 3 short retrorse teeth on right side just before apex; aedeagal brace rectangular, about as broad as

base of aedeagus; styles with large heel, base broadly excavated apices avicephaliform. In caudal view: styles with inner margins excavated, apices avicephaliform, inner corners extended into slender sharp beaks, outer broadly rounded; aedeagal brace broad, strongly, roundly extended dorsally.

Types: Holotype ♂, allotype ♀, 23 ♂ and 3 ♀ paratypes, Mead Co., Kan., Sept. 6, 1949, R. H. Beamer; other paratypes: 11 ♂ ♂ and 6 ♀ ♀, Meade Co. St. Pk., May 2, 1948, R. H. Beamer; 1 ♂ Hutchinson, Kans., Aug. 5, 1945, R. H. Beamer.

Types in the Snow Entomological Collections.

Delphacodes nigrinota n. sp.

Macropterous form:

Resembling **Delphacodes campestris** Van Duzee but almost all of mesonotum black and male with aedeagal brace not visible in lateral view. Length ♂ 3.5 mm.; ♀ 3.7 mm.

Structure: Front almost three times as long as greatest width, widest about apical third, gradually narrowed to apex, slightly more so toward base, distinctly tricarinate; crown almost rectangular, slightly longer than wide, distinctly carinate; elytra extending about one-third their length beyond abdomen, semihyaline, widest beyond cross veins, veins raised.

Color: General ground color stramineous, area between carinae of front spots on and above coxae, most of scutellum in ♂, venter of pygofer, styles and diaphragm often nearly black.

Genitalia: In lateral view: pygofer almost rectangular; anal segment without processes; aedeagus about twice as wide at base as average width of shaft, gently curved ventrally, usually five short, retrorse teeth on right side of outer half; aedeagal brace not visible; styles widest at base, sides more or less parallel, sinuate, apices narrowed. In caudal view: styles widest at base, diverging sharply on basal third, then directed dorsally; aedeagal brace deeply excavated.

Types: Holotype ♂, McAllen, Texas, Dec. 30, 1945, R. H. Beamer; allotype ♀, 20 ♀ and 21 ♂ paratypes, 9 mi. northwest of Jalapa, Vera Cruz, Mexico, Dec. 31, 1949, R. H. Beamer.

Brachypterous form:

Resembling the macropterous form except elytra just reaching beyond abdomen with apices broadly rounded.

Types: Holomorphotype ♂, allomorphotype ♀, 100 ♂ and 42 ♀ paramorphotypes, 9 mi. northwest of Jalapa, Vera Cruz, Mexico, Dec. 31, 1949, R. H. Beamer; other paramorphotypes: 111 ♂ ♂ and 55 ♀ ♀, same time and place, L .D. Beamer; 9 ♂ ♂ and 7 ♀ ♀, same time and place, J. G. Shaw.

Types in Snow Entomological Collections.

Delphacodes atrata Osb.

Delphacodes atrata Osborn H. Bull. Ohio Biol. Sur., p. 344, 1938.

Macropterous form:

Resembling **D. basivitta** as the original description says but distinctly larger with the ♂ genital capsule very deep and flaring from caudal view.

Genitalia: In lateral view: pygofer almost circular; anal segment with a pair of basally wide processes, extending caudo-ventrally; aedeagus widest

on basal two-thirds, almost straight, sharply narrowed on apical third to an elongated knob-like apex; styles not visible. In caudal view: styles widest at base, diverging at more than right angle, sinuate, narrowed to hooked apices; aedeagel brace deeply and rectangularly excavated.

Male specimens at hand from Ashford, Ithaca, Lancaster and Blue Mt. Lake, New York, and Ketchikan, Alaska.

Holotype male in the Ohio State Collections.

Brachypterous form:

Like the macropterous form except elytra about one-third longer than wide not reaching beyond abdomen, apices broadly rounded.

Color: Brown to almost black, females usually lighter than males.

Types: Holomorphotypes ♂, allomorphotype ♀, 58 ♂ and 24 ♀ paramorphotypes, Rome, Ohio, July 19, 1946, R. H. Beamer. Numerous other specimens on hand from Illinois, New York, Connecticut and New Hampshire.

Types in the Snow Entomological Collections.

Delphacodes dolera Spooner

Liburnia dolera Spooner, C. S., Can. Ent., 44: p. 240, 1912.

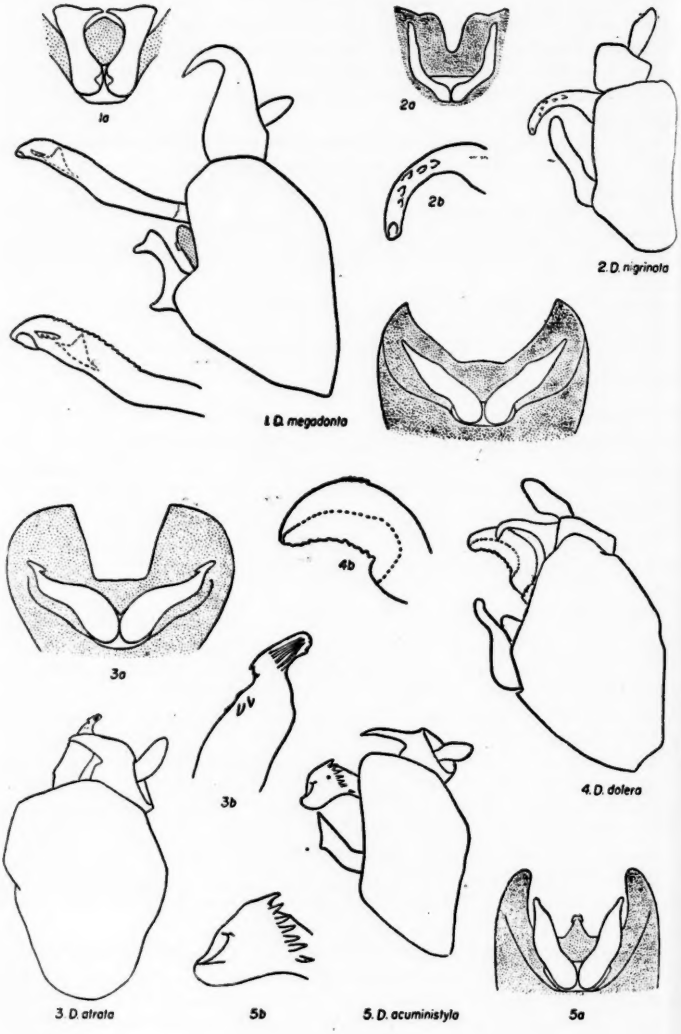
Macropterous form:

Closely resembling **Delphacodes atrata** Osb. but lacking both the dark coloring in the ♂ elytra and the black puncts on the veins and the genital capsule in caudal view much less flaring. Spooner's description is adequate for the males of which he had five except for the male internal genitalia.

The female is much lighter in color than the male. The elytra semihyaline, very slightly tinged with brown accounts for most of this lighter appearance.

Male internal genitalia: In lateral view: pygofer more or less rectangular with corners rounded, caudo-posterior margin bulging below middle with a short notch at ventral corner; anal segment with a pair of long processes projecting away from middle with outer third turned ventrad in sharp angle; aedeagus slightly more than twice as long as median width, curving gently ventrad throughout, outer third gently narrowed to rounded apex, about five small retrorse teeth on dorsal margin just beyond middle, entire ventral margin more or less serrate; aedeagal brace extended caudally in rounded hump, usually hidden in this view by flaring sides of capsule; styles widest at base sinuately tapered to rounded apices, often hidden by flaring sides of capsule. In caudal view: styles widest at base, strongly diverging, sides sinuate on basal half, strongly converging on apical third to sharp apices; aedeagal brace of diaphragm very slightly extended dorsally at middle, almost flat.

Types: Lectotype male, Renwick Swamp, Ithaca, New York, July 20, 1908, C. S. Spooner; 4 ♂ syntypes, same place, time and collector. In collection of C. S. Spooner. Allotype ♀ and 1 ♀ parallotype, Orland Park, Ill., July 13, 1946, R. H. Beamer; in the Snow Entomological Collections. Other material studied, 9 ♂ ♂, Bergen, New York, 13 ♂ ♂, Orland Park, Ill., and 1 ♂. Woodbridge, Va.


1a
1. D. megadonta
2a
2b
2. D. nigrinota
3a
3b
3. D. atrata
4b
4. D. dolera
5b
5. D. acuministyla
5a

Delphacodes acuministyla Dozier

Delphacodes acuministyla Dozier, C. L., Jour. New York Ent. Soc., 34: p. 259, 1926.

This is a small, beautiful insect which is very common from the Gulf of Mexico up to and including the New England states.

Dozier's description of the brachypterous form is very good except he omitted the internal male genitalia and in some short-winged males the entire elytra is almost black.

Genitalia: In lateral view: pygofer somewhat trapezoidal in shape, dorsal margin somewhat longer than ventral; anal segment with a pair of almost straight sharp processes about as long as one side of segment; aedeagus greatly swollen on outer third with a row of about fourteen retrorse spines encircling shaft at about widest place; aedeagal brace not visible; styles with sides almost parallel to slight projection on outer margin near outer third, narrowed from this projection to make sharp point with inner margin. In caudal view: styles widest at base, sides sinuate to outer third, then narrowed to sharp apices; aedeagal brace greatly extended dorsally with sides converging, ending in slightly concave apex with two short caudally projecting hooks.

Females like the males except stramineous in color throughout.

Types: Described from 14 males from Ocean Springs, Miss. I am here designating allotype ♀ and 57 ♀ parallotypes, Colchester, Conn., Aug. 10, 1946, R. H. Beamer. Holotype ♂ and 1 ♂ paratype in U.S. National Museum.

Macropterous form :

Like the brachypterous form except with flight wings extending about one-third their length beyond abdomen and color more evenly darker brown.

Types: Holomorphotype ♂ allomorphotype ♀, 8 ♂ ♂ and 1 ♀ paramorphotypes, Storrs, Conn., Aug. 14, 1946, R. H. Beamer; other paramorphotypes: 1 pair, Mansfield Center, Conn., Aug. 8, 1946, R. H. Beamer; 1 ♂, Willimantic, Conn., Aug. 5, 1946, R. H. Beamer; 2 ♂ ♂ and 1 ♀, Colchester, Conn., Aug. 10, 1946, R. H. Beamer; 2 ♂ ♂ and 1 ♀, Woolwine, Va., Sept. 1, 1946, R. H. Beamer.

Allotype, parallotypes and morphotypes in Snow Entomological Collections.

EXPLANATION OF PLATE

1. **Delphacodes megadonta,** lateral view of genital capsule; 1a, caudal view of styles and aedeagal brace; 1b, aedeagus enlarged.
2. **Delphacodes nigrinota,** lateral view of genital capsule; 2a, caudal view of styles and aedeagal brace; 2b. aedeagus enlarged.
3. **Delphacodes atrata,** lateral view of genital capsule; 3a, caudal view of styles and aedeagal brace; 3b, aedeagus enlarged.
4. **Delphacodes dolera,** lateral view of genital capsule; 4a, caudal view of styles and aedeagal brace; 4b, aedeagus enlarged.
5. **Delphacodes acuministyla,** lateral view of genital capsule; 5a, caudal view of styles and aedeagal brace; 5b, apical half aedeagus enlarged,

INSECTICIDAL CONTROL OF ARMYWORM[1,2]

FLOYD D. MINER AND CHARLES LINCOLN[3]

The use of poisoned bran bait for armyworm and cutworm control is one of our oldest recommendations and at times most spectacular in results. It was not, however, altogether satisfactory in Arkansas during the armyworm outbreak of 1948. Sodium fluosilicate was substituted for arsenicals as the active ingredient, principally because of favorable experience with it during the war years when arsenicals were scarce. Experimental work and field observations were undertaken in 1949 to re-evaluate the effectiveness of baits against armyworm and to test a number of newer organic insecticides.

Results indicate that bran bait is quite satisfactory when Paris green is the active ingredient, and that toxaphene as dust or spray is also highly effective.[4]

Preliminary insecticide testing was carried out in the Fayetteville laboratory on limited numbers of first and second instar larvae. Paris green was more effective than sodium fluosilicate in bran bait. Bran baits utilizing toxaphene and chlordane were effective but were not compared with Paris green or sodium fluosilicate. Ten per cent toxaphene and five per cent DDT dusts effected 100% kills when untreated first and second instar larvae were introduced into dusted cages and foliage. DDT and rotenone aerosols were effective, the rotenone remarkably so. A one per cent rotenone aerosol was somewhat faster than a ten per cent DDT aerosol although both eventually produced a complete kill. Larvae were exposed thirty seconds to the rotenone and one minute to the DDT. A toxaphene aerosol was not effective, but the material was made by extraction from wettable powder so that the formulation was somewhat in doubt.

Field plots located in oats near Stuttgart, Arkansas, were used to test baits, dusts, and concentrated sprays. The first experiment was a test of various active ingredients in bran bait. These were as follows, each added to 100 lbs. of wheat bran: (1) 1 lb. actual toxaphene (formulated from 25% wettable powder); (2) 4 lbs. Paris green; (3) 4 lbs. sodium fluosilicate; (4) 4 lbs. of 5.2% rotenone powder (cube'); and (5) 1 lb. actual chlordane (from 40% wettable powder). An unbaited check was included.

All baits were mixed with water to such a consistency that a few drops of water could be squeezed from a handful of bait when considerable pres-

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[1]**Cirphus unipuncta** (Haw.)

[2]Research Paper No. 937, Journal Series, University of Arkansas.

[3]Arkansas Agricultural Experiment Station and Arkansas Extension Service, respectively.

[4]Numerous individuals and agencies contributed critical assistance or materials without which such an accelerated form of experimental work could not have been successful. Among these were Gilbert Franzen, a grower, who allowed free use of his fields and paid application costs of an experimental airplane application of concentrated sprays. Materials for this same experiment and others were donated by Reasor-Hill Corporation of Jacksonville, Arkansas, and by the Hartz Seed Company of Little Rock. The Dockery Flying Service, Stuttgart, made an experimental plane application free of charge. J. O. Dockins, Superintendent of the Rice Branch Experiment Station at Stuttgart, contributed liberally of Station facilities.

sure was exerted. Plots were one-twentieth acre (43.5 feet by 50 feet). Each treatment was replicated three times. The plot layout was irregular due to certain practical considerations, consisting of two adjacent rows of nine plots each, running north and south. All six treatments were randomized within the northernmost six plots in one row, and again in the southernmost six plots in the other row. The remaining replication was split, part being placed at the south end of the layout and part at the north.

Bait was broadcast by hand at the rate of twenty pounds dry basis per acre. Applications were made between five and six p.m. of May 2. The evening was warm and a heavy dew followed. The infestation was light and the oats thin in stand. Considerable foliage had been lost to the worms. For some reason the worms did not appear as active as in other parts of the field, a condition possibly reflected in subsequent low kills. The more vigorous worms may already have moved out.

The method used in evaluating results in each plot was to count all living and dead worms along a single drill row of grain until approximately 25 worms had been counted. Portions of this count were made in three different locations in the plot. A dead worm was defined as one unable either to crawl or curl up when touched.

Results after 40 hours are shown in Table I. Paris green, although not producing as high a kill as was desirable, was easily best among the baits. Counts made in the same plots 64 hours after treatment gave Paris green 88.4% kill; sodium fluosilicate 61.3; toxaphene 45.3; rotenone 9.2; chlordane 52.3; and the check 1.3.

TABLE I

Effectiveness of Various Baits against Armyworms after 40 Hours; Field Tests at Stuttgart, Arkansas, 1949.

Active Ingredient	Replicate	Number Alive	Number Dead	Per Cent Kill
Toxaphene	1	5	20	
	2	15	10	
	3	21	5	46.1
Paris green	1	0	25	
	2	8	20	
	3	15	16	72.6
Sodium fluosilicate	1	10	15	
	2	7	18	
	3	17	8	54.7
Rotenone	1	24	1	
	2	24	1	
	3	24	1	4.0
Chlordane	1	9	16	
	2	15	10	
	3	21	11	45.1
Check	1	25	0	
	2	25	0	
	3	25	0	0.0

Concentrated sprays were tested the same evening in plots adjacent to the ones above. A portable engine-driven mist blower mounted in a pick-up truck was used to atomize an oil spray into a very fine mist and blow it out across the grain where it settled. Conventional plots were not laid off; the truck was simply driven slowly along a field road and the insecticide blown out over the grain. A forward distance of 50 feet was driven for each insecticide, after which the spray tank was flushed and the next material applied. Two replications were used, but the entire second replication was unsatisfactory due to nozzle stoppage. This occurred when rotenone extract reacted with fuel oil remaining in the tank, forming a viscous precipitate. Even the first application of rotenone was not entirely satisfactory, but no other materials in the first replicate were affected since rotenone was last in the series.

Rates of application were not closely determined since the width of coverage was not known exactly. As nearly as could be determined the spray covered adequately a strip about 10 feet wide. If so, the rate was between 3 and 4 gallons per acre.

Materials tested were (1) toxaphene 10%[1], made by diluting one part of a 40% oil concentrate with three parts of tractor fuel oil by volume; (2) chlordane 5%, made by diluting one part of a 40% oil concentrate with seven parts of tractor fuel oil; (3) a mixture of toxaphene 8.6% and chlordane 1.7%, made by diluting one part of an oil concentrate (34.5% toxaphene, 6.9% chlordane) with three parts of tractor fuel oil; (4) DDT 6.25% made by diluting one part of a 25% oil concentrate with three parts tractor fuel oil; and (5) rotenone 0.6% made by emulsifying one part of 5% oil concentrate with seven parts of water.

The infestation was high and the worms active in these plots. The grain was moderately rank. Considerable foliage injury had already been caused by worms.

Counts were made after 40 hours in the manner previously described except that 75 to 100 worms were counted in each plot. Kills for the first replicate are indicated in Table II. Toxaphene was by far the most effective material, although the kill was not high. A possible explanation lies in the fact that the operators were not particularly adept at handling the unfamiliar application equipment.

TABLE II

Effectiveness of Various Concentrated Sprays against Armyworms after 40 Hours; Field Tests at Stuttgart, Arkansas, 1949

Material	Number Alive	Number Dead	Per Cent Kill
Toxaphene	30	76	71.7
Chlordane	53	22	29.3
Toxaphene-Chlordane	38	64	62.7
DDT	57	18	24.0
Rotenone	72	3	4.0

[1]All percentages of sprays are approximate, due to differences in specific gravity of the diluents.

Three dust mixtures were compared May 3 in a series which included Paris green bait as a standard. Plots were one-twentieth acre each, measuring 43.5 feet by 50 feet. There were three replicates of each material, the plots being laid off in one long straight row except the last two which were placed beside the first two. Infestation was high and the worms active. The materials were applied just before dark. The evening was warm with only slight air movement. A rotary hand gun was used.

Materials tested were: (1) 20% toxaphene dust made from 25% wettable powder and talc; (2) 10% chlordane dust made from 40% wettable powder and talc; (3) 5% DDT dust made from technical DDT and talc; (4) Paris green bait (4 lbs. Paris green in 100 lbs. wheat bran, 20 lbs. dry basis per acre). Untreated checks were left. All dusts were applied at the rate of 20 lbs. per acre.

Results after 40 hours are shown in Table III. Toxaphene dust was definitely superior to other dusts, although Paris green in bran bait produced the best kill in the experiment. The check suffered a slight mortality, probably from drifting dust. Another count on three of the treatments was made at 64 hours. At this time the toxaphene showed a kill of 89.4%; chlordane 46.2%; and DDT 8.0%.

TABLE III

Effectiveness of Various Dusts and Paris Green Bait against Armyworm after 40 Hours; Field Tests at Stuttgart, Arkansas, 1949.

Material	Replicate	Number Alive	Number Dead	Per Cent Kill
Toxaphene dust	1	9	41	
	2	5	50	
	3	12	42	83.6
Chlordane dust	1	35	23	
	2	26	26	
	3	26	32	48.2
DDT dust	1	47	3	
	2	49	6	
	3	50	3	7.6
Paris green bran bait	1	3	47	
	2	4	65	
	3	1	49	95.3
Check	1	47	5	
	2	54	1	
	3	47	5	6.9

Two additional dusts were tested May 4 on one-twentieth acre plots by means of a rotary hand gun. These were 2% parathion dust and a mixture of 3% benzene hexachloride and 5% DDT dust. Three replicates were used. After 40 hours the BHC-DDT dust had given a kill of 60% and the parathion a kill of 52% on two of the replicates. The third replicate was not counted due to extreme pressure of time and the obvious mediocre showing of these materials.

An experimental airplane application of 10% toxaphene in fuel oil was made May 4 on 2.6 acres of oats. The plane was equipped with a 12-foot

breaker-bar type spray boom delivering 3 gallons per acre at normal speed. The droplet size was such that the spray appeared as a coarse mist, descending on a slant with the light breeze which was blowing. Excellent coverage was evidenced by samples accidentally caught on parked automobiles. The plane was flagged to 33 foot swaths, except for certain swaths partially lapped and others widened to give a variation in rate.

Excellent control was indicated by counts made after 48 hours. Counts of 25 larvae were made at each of 15 stations distributed at right angles to the path of the plane. Of 377 larvae counted, 359 were dead, representing a kill of 95.2%. In areas of slightly lower dosage the kill was observed to be proceeding more slowly, but formal counts nevertheless showed an excellent kill. This would indicate that slightly less than three gallons to the acre might be satisfactory.

The same plane and equipment sprayed seven acres of oats the following evening at the rate of 3 gallons per acre, using the toxaphene-chlordane mixture previously mentioned. (See Table II.) Toxaphene undoubtedly was the important ingredient in this mixture; it was tested, however, because in certain areas it was more readily available than the pure toxaphene concentrate. The stock solution was diluted one to three with tractor fuel oil, as previously. After 24 hours an excellent knock-down was observed, and it was estimated that a satisfactory kill was in progress. No actual counts were made. Subsequent reports from the grower indicated excellent control.

A moderate speckling of foliage was observed in some spray plots which was assumed to be oil injury. This apparently had no effect on quality or yield of the crop, which was rapidly approaching maturity at this time. Extensive spraying was carried out later by growers over the state, but no unfavorable reports were heard concerning oil injury. It is possible that water would have served as well as oil as a diluent. However, there were certain questions regarding the behavior of water in such a spray. Therefore, since time available for trial and error was limited, the oil was chosen on the basis of satisfactory past performance. One report reaching the authors of a comparison between water and oil by a grower indicated the oil to be superior.

Observations made by Johnson A. Neff, U.S. Fish and Wildlife Service, indicated that toxaphene was highly toxic to fish where it drifted into bodies of water.

CONCLUSIONS. It was concluded that the best of these insecticidal controls for armyworm were: (1) Paris green bran bait at 20 lbs. per acre; (2) 10% toxaphene spray in oil at three gallons per acre; and (3) 20% toxaphene dust at 20 lbs. per acre. Each of these materials has certain desirable features which should be considered in making a choice. If economy is a major consideration, bran bait would be used. If the grower is unable to devote his time and crew to the task, the plane application of dust or spray would be selected. Probably the spray treatment is more effective than dust under a variety of climatic conditions, but a plane equipped to dust may be easier to obtain than one equipped to spray.

All three of these treatments were later observed in successful use by growers.

TWO NEW SPECIES OF LEPTOPODIDAE (HEMIPTERA)

C. J. DRAKE AND F. C. HOTTES

Since the publication of Horvath's **Revision des Leptopodes,** Ann. Mus. Nat. Hist., 9:38-370, 5 figs., 1911, only one new leptopodid has been described. This species was characterized by Dr. R. L. Usinger from specimens collected in the Philippines. The present paper contains the descriptions of two new species, one from Java and the other from Madagascar. The disposition of types is given under the description of new species.

Leptopodidae Costa, 1838, are semiaquatic "shore bugs" found in tropical and subtropical regions of the old world. The family is composed of five genera—**Erianotus** Fieber, 1861; **Leptopus** Latreille, 1809; **Martiniola** Horvath, 1911; **Patapius** Horvath, 1912 (=**Cryptoglena** Horvath, 1911); and **Valleriola** Distant, 1904. The five genera are represented by a total of only 14 species, including the new forms described below .Very little is known about the habits, distribution and ecology of most of the species.

Valleriola buenoi (Usinger)

Erianotus buenoi Usinger, Brookl. Ent. Soc. Bull., 37:103. 1942.

As the number of rows, size, distribution and arrangement of both long and short spines on the underside of the fore pair of legs and the general shape of the body are in accord with the species of the genus **Valleriola** Distant, **E. buenoi** Usinger is herewith transferred to this genus. These spines are very well described in the original description of **buenoi.** We are indebted to Dr. Usinger for kindly loaning us a paratype of his species.

The three genera **Erianotus-Valleriola-Martiniola** are quite distinct, not readily confused and do not represent a single monophyletic group. Due to an error in the key (Horvath, 1911) relative to armature on the fore legs, one is quite apt to confuse these genera.

Specimens of all the described species of the genus **Valleriola** Distant have been examined. The recognized species are **V. assouanensis** (Costa), **V. buenoi** (Usinger), **V. circindeloides** Distant, **V. moesta** Horvath, **V. strigipes** (Bergroth) and **V. javanica,** n. sp. As **V. greeni** Distant is here synonomized with **V. assouanensis,** the latter now becomes the valid name of the type of the genus. The writers are indebted to Dr. R. J. Izzard of the British Museum for pointing out the above synonomy, also for arranging the exchange of leptopodids.

In **Erianotus lanosus** Dufour, the spines on the front legs are quite distinctive. On the underside of the femora, there are two long rows (one on front margin and other on hind margin) of straight, moderately long, dark fuscous spines. The long spines are placed on the tops of short conical fustrums; in general, they are more or less subequal to the diameter of the femora at their respective points of origin. Both long and short spines point practically straight downwards, and there is no median row of shorter spines between the marginal rows. The longer spines are much shorter and do not divaricate apically between the rows as in **Martiniola,** and they are longer than in **Valleriola.** Each tibia bears only one long median row of rather short, dark fuscous spines. These spines are all subequal in length to

the diameter of tibia and all of them lean uniformly outwards. The tibial spines are set a little farther apart and are also a little longer than in **Martiniola** and **Valleriola.** There are two extremely long, white spines on each side of the first rostral segment, and three extremely long ones on the underside of each side of the head. The dorsal surface is clothed with long pale hairs with recurved tips.

In the other two genera, the armature of the front pair of legs are as described below in the new species of **Valleriola** and the redescription of **Martiniola madagascariensis** (Martin). A left paramere of a species in each of the three genera is figured. Specimens of **E. bergi** Jakovleff have not been seen. Good diagrammatic drawings of the hemelytral venation of all five genera of leptopodis are given in Horvath's Synopsis (1911) of the family.

Valleriola assouanensis (Costa)

Leptopus assouanensis Costa, Atti Accad. Sc. Napol., 7:9. 1875
Leptopus niloticus Reuter, Berl. Ent. Zeitschr. Nouv. ser. III, No. 20, p. 2. 1911
Valleriola greeni Distant, Faun. Brit. Ind. Rhynch., 2:406, fig. 259. 1904
Valleriola assouanensis Horvath, Ann. Mus. Zool. Napol. ser. III, No. 20, p. 2. 1911
Valleriola assouanensis Horvath, Ann. Mus. Nat. Hung., 9:364. 1911.
Valleriola greeni Horvath, Ann. Mus. Nat. Hung., 9:364. 1911

As pointed out elsewhere, **greeni** is a synonym of **assouanensis.** It is widely distributed in the Mediterranean region of Europe and Africa and spreads eastward into India. The pale hairs on legs and dorsal surface of the body are much shorter and not nearly as numerous as in **V. moesta** Horvath.

Valleriola moesta Horvath
Figure 1, I

Valleriola moesta Horvath, Ann. Mus. Nat. Hung., 9:363. 1911

Several specimens, Butenzorg July 11, 1930 R. W. Becking and O. Soemba, Mao Marrol, Java, May, 1925, collected by Dammerman. Known heretofore from the type locality, Uganda, Africa. The whitish hairs of the legs are extremely long and stand practically at right angles on the surfaces of femora and tibiae. The dorsal clothing of the body is composed of much longer and more numerous whitish hairs than in other members of the genus.

Valleriola javanica, sp. n.

Form elongate, nearly parallel-sided, more than three and one-half times as long as wide, sparsely clothed on the dorsal surface with pale, erect hairs, the markings small, flavous. Head black, shining, deeply widely concave between the eyes, the pubescence appressed, blackish, the large oval spot just behind the ocelli yellowish orange; ocelli reddish brown, placed rather close together on the top of a short, dark elevation; clypeus yellowish brown, bulbously swollen; bucculae short, coarsely pitted, open in front and above, yellowish white; front deeply longitudinally furrowed along median line; head on each side beneath with three extremely long, slender, white spines, without long pale hairs. Eyes subpedunculate, exceedingly large, grayish brown, distinctly converging anteriorly, concave within along the anterior three-fourths of lower side, and then deeply roundly, subapically notched on

apical fourth; interoccular space behind greater than the diameters of both eyes conjoined, more narrowly separated in front. Rostrum stout, reaching between fore coxae, testaceous, with two very long, straight, laterally-projecting spines on each side; II and III smooth, scarcely darker; proportions—I,25;II, 15;III,8. Antennae very long, very slender, brownish black, indistinctly pilose; segment I very short, testaceous, unarmed, with few pale hairs, strongly swollen, narrowed towards both ends, widest near middle; II slender, stouter than next two, slightly enlarged at tip; III and IV very slender, filiform; proportions—I,14; II,35; III,72; IV,95.

Pronotum blackish, with considerable bluish bloom, coarsely pitted, impunctate on humeral angles and swollen disc of fore lobe, strongly narrowed anteriorly in front of humeri; wider at base than median length (52:40); collar distinct, with two transverse rows of pits; front lobe strongly swollen on disc, deeply impressed on median line, with a single pit near middle of furrow, sparsely clothed with long pale hairs; hind lobe convex, rounded behind, with pits smaller than in **assouanensis,** a median basal stripe, another on each side of it and exterior margins narrowly flavous or yellowish brown. Scutellum black-fuscous with tip flavous, a large dark, subbasal, laterally-projecting tooth on each side, sides raised along the outer margins, deeply impressed on disc, with two large pits near the hind margin of impression.

Legs very long, slender, pale testaceous, sparsely clothed with moderately long, pale hairs, with pale brown stripes on dorsal surface of femora; coxae large, fuscous, shining, flavous apically; trochanters small, flavous; fore femora stout, strongly tapering apically beyond the middle, beneath armed with two long rows of erect, slender, sharp, dark spines, the rows converging a little apically, each row composed of many short, closely-set spines and three (or four) much longer erect spines, the first long spine placed near the base, the third beyond the middle, and the other about equidistant between them; fore tibiae armed along median line with one long row of short, sharp, closely-set, brown spines, each tilted distinctly outwards; middle femora slenderer, more strongly tapering outwardly from basal third; hind femora longer and also tapering outwardly from basal third, middle and hind tibiae brownish above, beset with bristly, brown spines; tarsi brown, shortly setose.

Hemelytra practically three times as long as wide, with considerable bluish bloom, gradually arcuately narrowed posteriorly, extending about one-third their length beyond the tip of abdomen, the outer margins from base up to apical third of membrane flavous, opaque, darker apically; clavus with a long inner and a shorter bordering row of large pits, the subapical flavous spot formed by the color marks on the inner marginal veins of both clavi; corium also with a few rows and partial rows of large pits, the smaller punctures concealed largely by bloom, with two or three subapical spots flavous, one of which is in the outer cell of membrane; membrane deeply clouded with fuscous, composed of four long cells. Abdomen beneath dark fuscous with whitish pile, the last venter pale in female. Male unknown.

Length 5.10 mm.; width, 1.20 mm.

Type, female, Butenzorg, West Java, July, 1936, R. N. Becking, in the collection of Rijksmuseum van Natuurlijke Historie, Leiden, Holland, one paratype, female, taken with type, in collection of C. J. Drake.

This species is closely allied to **V. strigipes** (Bergroth) from Madagascar, but differs from it in having shorter second and third antennal segments and more sparsely hairy clothing on dorsal surface of the body. The hind lobe of the pronotum is also rougher and has larger pits in **V. strigipes.** The latter is also more conspicuously marked with brown on the pronotum; and the callus of fore lobe of pronotum is smaller and bears a few more pale hairs.

V. moesta Horvath is a much larger species with very prominent dark stripes on the legs. The hairs on the legs are extremely long and stand out at right angles to the surface; dorsal clothing of pale hairs is much denser and also distinctly longer. In fact, it is rather difficult to confuse **moesta** with any other species of the genus.

V. buenoi (Usinger) is slender and has shorter third and fourth antennal segments. The legs are clothed with fewer and shorter hairs, and the spots on the hemelytra are more pronounced. The other two species of the genus have been very well figured by Distant.

Leptopus horvathi, sp. n.

Small, elongate, black-fuscous, marked with flavous, the dorsal surface of head, pronotum and hemelytra unarmed and without long hairs. Head with grayish black, appressed pubescence, very broad, broadly deeply concave between the eyes, strongly declivous in front, there furrowed along median line; large quadrate spot behind ocelli, front (save fuscous furrow), clypeus, labrum (narrowly margined with fuscous) and head beneath flavous; underside of head with three extremely long whitish spines on each side. Ocelli yellowish, placed close together on top of short, dark fuscous elevation. Clypeus with bulbous area yellowish. Eyes extremely large, widely separated, subpedunculate, converging anteriorly, beneath with inner margin concave along the anterior three-fourths, then deeply, roundly, subapically excavated on posterior fourth, the notch yellowish.

Rostrum stout, armed, extending between fore coxae; segment I testaceous, longest, with two very long, slender spines on each side, a long bristly hair between the spines; II broadly flattened, wider than one, slightly embrowned, with two long spines on each side; III short, pointed, ferruginous; proportions—I, 20; II, 13; III, 8. Antennal segment I short, swollen, testaceous, the others broken off.

Legs very long, slender, testaceous, with dark fuscous stripes on dorsal surface of femora, the front femora also with basal stripe and large apical spots on outer part of hind surface. Precoxal plates of fore legs testaceous, each armed with long, whitish spine; coxae testaceous, long, each also armed with a long, whitish spine; trochanters short, testaceous. Fore femora with three rows of spines; (1) row of five extremely long, whitish spines along posterior edge of undersurface and as a part of the same row, a series of very short, dark fuscous, erect spines (two or three between each pair of large spines) lined up in the row just back of the front edge of the large spines, each large spine points downward and a little posteriorly; (2) long row of very short, erect, fuscous spines placed near the median line of underside between front and hind rows; (3) row of fine very long spines placed a little beneath the middle of front surface, each of which points forward and

slightly downwards. Fore tibiae with (1) a median, longitudinal row of rather short, slender, closely-set brown spines, all tilted uniformly outwards; and (2) row on front surface (in line with similar row on femora) contains only three or four long spines on basal half, thence with short, bristly, closely-set spines to the apex. Long spines on fore legs placed on short, dark fuscous conical fustrums or bases. Tibiae of middle and hind legs slightly embrowned above.

Pronotum black, narrowed anteriorly in front of humeri, slightly wider at base than median length (38:31); collar distinct, truncate in front, with two transverse rows of pits; front lobe strongly swollen on disc, deeply furrowed along median line, the swollen area impunctate; hind lobe with posterior margin, a median, basal stripe and a small patch on each side of stripe flavous, slightly rounded behind, coarsely pitted. Scutellum slightly shorter than wide, unarmed above, with a broad, subapical, laterally-projecting tooth on each side.

Hemelytra a little longer than abdomen, coarsely pitted, black-fuscous, the outer border (save apices, base narrowly, spot in front of middle, three apical spots (one in membrane) and inner marginal veins of corium flavous; clavus with marginal vein within and basal strip near the middle flavous, membrane deeply fuscous, with four long cells, the outer cell coriaceous and pitted. Abdomen black-fuscous, the hind margin of segments flavous.

Length, 3.35 mm.; width, 1.00 mm.

Type, male, Tealo, Madagascar, Aug., 1948, in Muséum National d' Historie Naturelle, Paris, France.

As in other leptopodids, the number of very long spines may vary plus or minus one in any row. And at times, some of the long spines may be badly bent, twisted or even entirely broken off before the insect is taken in the field. The small spines are also subject to serious accidents.

The size, location, and arrangement of the spines on the lower surface of the fore legs, strongly flattened and armed second rostral segment and venation of the hemelytra seem to place **horvathi** in the genus **Leptopus** Latreille. As the dorsal surface of the body is totally unarmed and without hairy vesture, **L. horvathi** is not easy to confuse with other members of the genus. The three last segments of the antennae are also needed for generic placement. Two other leptopodids, **V. strigipes** Bergroth and **M. madagascariensis** (Martin) are known from Madagascar.

Martiniola madagascariensis (Martin)

Figure 1, I

Erianotus madagascariensis Martin, Bull. Soc. Ent. Fr., 1897, p. 274.

Martiniola madagascariensis Horvath, Ann. Mus. Nat. Hung., 9:366, fig. 3. 1911.

Head black, rather densely clothed above and beneath with long, very coarse, white hairs, armed on each side beneath with three, extremely long, white spines, the other white spines nearer the eyes (beneath and behind) much shorter; front strongly declivous, yellowish brown or flavous, deeply furrowed along median line, armed with two pairs of long, white spines—first pair (one on each side of furrow) placed a little behind the front mar-

gins of the eyes and the other pair located near the middle of the front, one on each side of the furrow; clypeus very strongly swollen, yellowish, armed on top of elevation with three pale, nearly erect spines; labrum rounded apically, brownish, clothed with short, whitish hairs; bucculae pale testaceous, entirely open, projecting shield-like anteriorly, rounded at apices. Ocelli yellowish, placed close together on top of a short, cylindrical, dark-fuscous elevation; elevation armed with two pairs of erect, whitish spines, one on front surface and other on hind face; large yellowish spot on head just behind ocelli. Eyes exceedingly large, grayish brown, subpedunculate, widely separated, the surface of head between them deeply, widely concave; lower margin of each eye within concave on anterior three-fourths, deeply roundly excavated on apical fourth, the notch yellow and armed with an erect pale spine. Rostrum stout, extending between fore coxae; segment I pale testaceous, armed on each side with three, extremely long, whitish, laterally-projecting spines, each of which arises from lower edge of outer surface; II dark ferruginous; proportions—I, 15; II, 12; III, 8. Antennae very long, very slender, brownish; segment I very stout, testaceous, with a few short testaceous spines, each placed on a slightly raised area and leaning forward; II very long, slender, enlarged a little at tip, slightly thicker than other two; III and IV very slender, filiform, the latter very shortly pilose; proportions—I, 10; II, 42; III, 45; IV, 26.

Pronotum reddish fuscous to dark fuscous, armed with numerous pale, erect spines on dorsal surface, wider at base than median length (48:36), the spines along outer margins projecting laterally, collar partly brownish, with two transverse rows of pits, armed with an erect spine on each side of middle; front lobe moderately convexed, without pits, spined; hind lobe moderately convex, narrowly brownish or flavous along sides and hind margins, with five short, spined ridges on disc, one median and two on each side. Scutellum black, pale at tip, wider than long, impressed basally, armed with pale, erect spines on ridge along outer margins. Hemelytra brownish to dark fuscous, with six flavous spots on each hemelytron, armed with numerous, pale, erect spines; exocorium pale, semitransparent, slightly reflexed, unarmed on dorsal surface, the numerous pale spines along outer margins leaning posteriorly and terminating before reaching membrane; membrane deeply clouded with dark fuscous, extending a little beyond tip of abdomen, with four long cells, the basal portion of cells two and three coriaceous, flavous, pitted. Abdomen beneath fuscous, the segment broadly whitish apically.

Legs very long, slender, testaceous, with broad fuscous stripes on femora; tibiae indistinctly pilose, brownish above. Precoxal plates of fore coxae testaceous, each armed with a long, slender, testaceous spine; trochanters short, testaceous. Anterior femora stout, somewhat compressed laterally, armed with three long rows of spines on underside; (1) row along median line composed of rather short, slender, white spines (difficult to see on account of pale color) placed rather closely together, a few extra spines along sides; (2) anterior row placed on front edge composed of six extremely long spines and one or two short, brown spines between each pair of long spines, each long spine arising from the top of a white, stout, conical fustrum and point-

ing obliquely forward and downward, the three long basal spines white and other three dark fuscous; (3) hind row placed along posterior edge, the number and arrangement of both long and short spines as in front row, save that all are dark fuscous and point obliquely downward and backward. Spines between front and hind rows strongly divergent, and extremely long spines two or three times as long as the diameter of the femora. Fore tibia armed with two long rows of extremely long divergent, fuscous spines, each placed on an enlarged dark base, and lean a little outwards, spines on front row also point downward and forward and in a downward-forward direction in the back row; one or two short, brown spines between each pair of long spines in both rows; long spines in a gradient series, longest at base. Middle and hind femora inconspicuously armed along upper sides of front and hind surfaces with pale, short, outwardly-directed, seta-like spines.

Redescribed from several specimens from Madagascar. Known only from this island. Teneral specimens are brownish and not conspicuously marked on the hemelytra. The extremely long, divergent spines on the underside of anterior femora and tibiae are quite distinctive, and thus **M. madagascariensis** is not readily confounded with other species of leptopodids.

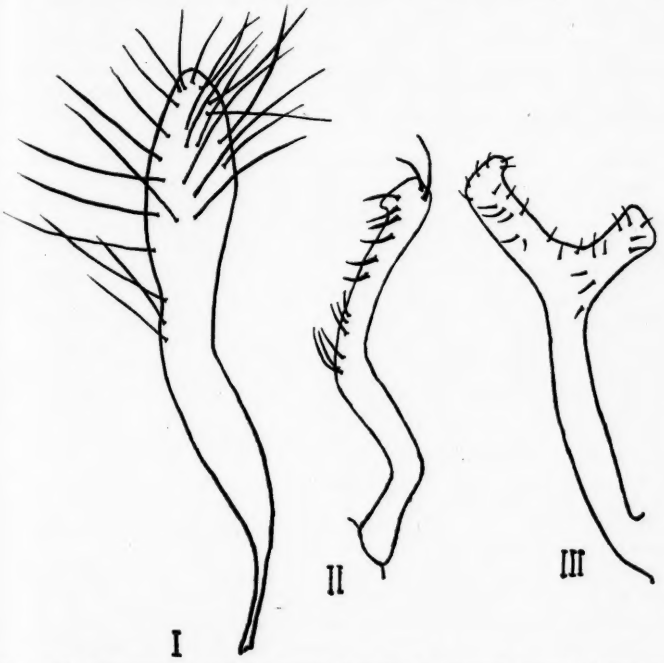

Fig. 1. Left parameres: I, **Valleriola moesta** Horvath; II, **Erianotus lanosus** Dufour; III, **Martiniola madagascariensis** (Martin).

NOTES ON ANDRICUS PILULA BASSETT (HYMENOPTERA, CYNIPIDAE), PRODUCING A VERNAL GALL ON QUERCUS GAMBELII NUTTALL IN NORTHERN UTAH

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Observation of the common scrub oak, **Quercus gambelii** Nuttall, in the Wasatch Mountains of northern Utah, during the past several years, has revealed numerous infestations of the leaves with a gall previously undescribed from this species of oak. The galls were first noted in the spring of 1949 when they suddenly appeared on the young foliage during the first three to four days of leaf emergence. Some of the galls that appeared on the main petiolar veins apparently reached full size within three to four days after the bursting of the leaf buds. Those near the leaf margins developed more slowly. The galls were observed throughout their development during the springs of 1949 and 1950 and specimens of wasps reared from them were determined by Lewis H. Weld of the Bureau of Entomology and Plant Quarantine, Department of Insect Identification, to be **Andricus pilula** Bassett, a form described from two females reared from **Quercus undulata** in southern Utah (Bassett, 1890). The male of this species is being described by Mr. Weld from this material.

Description of the Gall

The early appearance of the gall on the leaf suggests oviposition in the bud by this wasp during the previous fall. The galls, when mature, measured from three to six millimeters in diameter. Throughout early development they appear on the leaf as green, spherical, thin-shelled enlargements possessing a large internal cavity in which can be found an egg or very small larvae. The gall wall at this stage was soft and succulent and contained a high proportion of sap. Later, toward maturity, the wall differentiated into a well defined outer, fleshy coat from one-half to one millimeter in thickness; and an inner, white, paper-thin, fibrous coat or layer that formed the lining of the internal cavity containing the developing insect. Immature galls were generally leaf color, but continued development, especially in those galls exposed to direct sunlight, produced a reddish tinge that became more pronounced as development proceeded. Galls in shaded locations became only slightly tinged with red. Within a few days following the emergence of the wasp, the galls were reduced to hard remnants that persisted until the leaves dropped in the fall.

Galls were situated in the leaf blade associated with main or major branching veins. The majority encountered were in the distal angles of the mid petiolar vein and its branches. Frequently galls were also found on veins near the leaf margins, and when so located, were generally noticeably smaller and slower in development. At times, especially in areas of heavy infestation, small, stunted leaves were found that consisted of little more than one

or two galls on the main petiolar vein which apparently had prevented normal leaf expansion and development. In all galls that were seen, the leaf blade appeared to bisect the body of the gall with proportionately equal hemispheres appearing both above and below the leaf blade.

Notes on Distribution

Q. gambelii is the only species of oak in northern Utah. It is abundant in the Wasatch Mountains of this region where it forms stands in suitable locations in a range of 4800 to 8500 feet in elevation. This species of oak also reaches its northernmost limits of distribution in the Wasatch Mountains a few miles north of Salt Lake City. The oak is limited at its lower elevations by lack of moisture and drying winds and at its upper limits by the shade and short growing season. The most luxuriant stands occur in the lower limits of its range where the oak is the dominant plant. In the region of Salt Lake City, the lower limits of the oak range appear on the benchlands adjacent to the mountains proper. Here may be found islands of pure oak surrounded by large open areas of the herbaceous vegetation that is characteristic of the valleys of this region. Greatest infestation of the oak with **A. pilula** were found in this transitional belt and particularly on the fringe where the oak disappears into the valley vegetation. The wasp was found to prefer the outer edges of clumps of oak surrounded by open areas in preference to more solid and denser oak stands. Observation of these more isolated clumps revealed the galls concentrated primarily on the lower leaves of the plant, especially those below five feet in height. No infestation of leaves was noted at a distance of more than five feet into the stand.

Although galls could usually be located on oak along the benchlands in all regions examined, the degree of infestation varied greatly. Small areas of a few square feet could be found with a concentration as high as 50 gall per 100 inches of leaf surface with two to four galls per leaf. A few feet away, in the same thicket, galls might be entirely absent. Exposure to sunlight appeared to make no appreciable difference in the sites selected since areas of heavy infestation could be found on all sides of oak thickets.

Further examinations were conducted throughout the elevational range of the oak in the Wasatch Mountains. As previously noted, the infestation was greatest in the transitional zone between 4800 and 5300 feet. Although the oak persists along the canyon walls to an elevation of about 8500 feet. Above 5300 the galls became increasingly more sparse until at about 6000 feet elevation they disappeared entirely.

Notes on the Biology

During 1949, the first galls were noted on the oak leaves on May 5 when the oak at lower elevations were beginning to leaf. Leafing of the oak at 6000 feet was retarded by lower temperature and did not reach a comparable stage of development until a week to ten days later. Examination of the galls at this time revealed ova or small larvae. Continued examination at the lower elevations showed developing larvae present in the galls until May 22, when the first pupae were observed. On May 27, the majority of the galls opened contained pupae. Those still in the larval stage at this time were

found, upon rearing, to contain guest flies and not **A. pilula.** At this time, it was also observed that galls exposed to direct sunlight for a considerable portion of each day were from one to two days further advanced in development than those that were shaded for most of the day. On May 29, wasps cut from galls were active, and a number of galls were collected, taken to the laboratory, and reared under a bell jar. Emergence from this material began on May 31, when two males were observed. Continued rearing produced ten specimens on June 1, eleven on June 2, five on June 3, and ten on June 5. Reared specimens consisted of 15 males and 23 females, the males of which constitute the types of the species. These have been distributed to the Philadelphia Academy, the U.S. National Museum, the California Academy, the American and Chicago Museums and the University of Utah Museum.

During the spring of 1950, young leaves first appeared on April 23, but a frost the following night caused severe damage to the young foliage with new leaf development not occurring until May 12. Galls of **A. pilula** appeared on May 15 and appeared to grow to maximum size in three to four days. The first pupae were found on May 30, when about ten percent of the galls opened contained them. Specimens of galls taken to the laboratory at this time produced three males and thirteen females on June 8th and 9th. Further studies are being made to determine other phases of the life history.

Summary

A new type of gall, previously undescribed from **Quercus gambelii** Nuttall, was noted and studied during the spring of 1949 and 1950. Specimens of wasps reared from these galls were identified by Lewis H. Weld to be **Andricus pilula** Bassett. The development of the vernal generation was studied with larval development being completed in 17 to 21 days, the pupal development from eight to ten days, and with emergence during the first week in June.

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TWO NEW SPECIES AND A NEW GENUS OF SCOLYTIDAE (COLEOPTERA) FROM UTAH

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Carphoborus engelmanni, new species

Female—Body black to piceous in color, clothed with light yellowish-brown scales; 2.23 mm. in length, 2.55 times as long as wide; allied to **C. ponderosae** Swaine.

Front of head plano-convex with moderately coarse, close, rather deep punctures; moderately clothed with rather fine, light yellowish-brown hairs of medium length; epistoma rather weakly produced anteriorly at the center. Eye finely granulate, slightly more than one-third divided by an emargination on the inner margin. Antenna yellowish-brown, funicle five segmented; club 1.29 times as long as wide, sutures nearly straight, slightly oblique.

Pronotum .78 times as long as wide, posterior margin sinuate, sides weakly arcuate on posterior two thirds, broadly constricted on anterior third, anterior margin broadly rounded; punctures moderately fine, not deep, close; median line distinctly elevated on middle one-third; surface covered with closely placed erect scales.

Elytra 1.72 times as long as wide, sides subparallel, weakly arcuate; elytral base weakly arcuate, with about 8-11 serrations along basal margin, serrations broad and close near suture, pointed and sparse laterally; striae feebly impressed, punctures distinctly impressed, close, in regular rows; interspaces densely granulate punctate, clothed with numerous yellowish-brown scales. Declivity rather steep, second interspace narrowed, almost obsolete; first interspace moderately, third interspace rather strongly elevated and serrate, similar to but finer than in **C. ponderosae;** fifth and seventh interspaces each with five or six serrations near declivital base and devoid of serrations near apex.

Male frons with a moderate transverse impression above the epistomal margin, elevated above forming a broad, emarginated tubercle in the center at the upper level of the eyes; more coarsely punctured, otherwise similar to female.

This species differs from **C. ponderosae** in coarser frontal punctures, generally has more poorly developed epistomal process; finer somewhat spraser sculpture of declivity. It may readily be distinguished by the ninth interspace which is not elevated or serrate posterior to origin of the declivity as in **C. ponderosae.**

Type Locality—Logan Dry Canyon, Utah.

Host—Picea engelmanni.

Type Material—Holotype, allotype, 23 female and 9 male paratypes were collected at the type locality June 11, 1949, and two female paratypes May 30, 1947 from the same locality; one female paratype, Logan Canyon, Ut., July 24, 1946; one female paratype, Monte Cristo, Ut., July 20, 1949; and one female paratype, Beaver, Ut., Sept. 15, 1949. Holotype, allotype, and four

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paratypes are to be deposited in the U.S. National Museum, Washington, D.C.; the remaining paratypes are in the collection of the author.

Polygraphus convexifrons, new species

Female—Black, covered with moderately dense, small, semi-erect, white scales. Length 2.3 mm., 2.6 times as long as wide. Closely allied to **P. hoppingi** Swaine.

Front of head distinctly convex above the epistoma; finely, densely punctured, covered with short, fine, inconspicuous yellow hairs. Eye divided with 1-3 facets scattered along the posterior margin between the two halves. Antennal funicle of five segments; club unsegmented with the apex very strongly acuminate as in **P. hoppingi.**

Pronotum 1.25 times as wide as long, finely punctured, covered with erect scales; sides arcuately narrowed from base to moderate constriction just behind the anterior margin.

Elytra with fine, confused, somewhat granulate punctures; covered with semi-erect, white, scale-like hair. Declivity slightly flattened, the suture distinctly elevated.

A slender species, very similar to **P. hoppingi,** but readily separated by the distinctly convex frons and the much shorter frontal pubescense of the female. The frontal elevation of the male slightly higher than in **P. hoppingi.**

Type Locality—Logan Dry Canyon, Utah.

Host—Picea engelmanni.

Type Material—Holotype, one male and four female paratypes were collected at the type locality June 11, 1949. Allotype, and nine female paratypes were collected at Logan Canyon, Ut., July 6, 1948. Holotype, allotype, and four paratypes are to be deposited in the U.S. National Museum, Washington, D.C., the remaining paratypes are in the collection of the author.

Orthotomides, new genus

Antennal club subcircular, slightly wider than long, thickened at base, flattened distally, not obliquely truncate; three sutures on anterior face, the first segment occupying the basal half; posterior face with two sutures, the first segment subcircular, occupying the basal two thirds; similar to **Pityogenes** Bedel. Apical margin of declivity broadly rounded, not acute as in **Orthotomicus** Ferr. Declivity subsulcate, armed with small pointed granules in both sexes, similar to female **Pityogenes.**

Allied to **Orthotomicus,** from which it differs by characteristics of the antennal club and declivital apex, and to **Pityogenes,** from which it differs by the longer intercoxal process, absence of frontal pit in the female, and absence of prominent declivital teeth in the male.

Genotype—Orthotomicus lasiocarpi Swaine.

A NEW MESOVELIA FROM MEXICO AND GUATEMALA

H. B. HUNGERFORD
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In 1937 Mr. Henry Thomas collected three specimens, 2 ♂ ♂ and 1 ♀, of an undescribed Mesovelia that I labeled **Mesovelia thomasi** ms., hoping to secure more specimens before describing the species. One male is apterous,

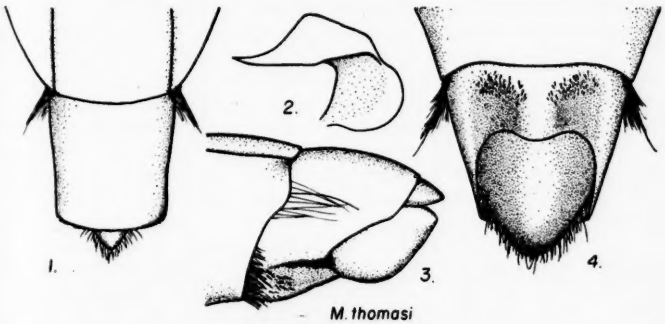
the other two are winged but have the membranes broken off. In transferring the Torre-Bueno material to our collections, I find a series of four males and six females from Guatemala that belong to this species and therefore offer a description of this new Mesovelia.

Mesovelia thomasi

Size: Apterous males: 2.3 mm. long; width across head .568 mm.; greatest width across thorax .651 mm.; greatest width across abdomen .672 mm.; winged male 2.43 mm. long; width across head .568 mm.; greatest width across thorax .756 mm. Apterous females: 2.646 mm. long; width across head .630 mm.; greatest width across thorax .84 mm.; greatest width across abdomen 1.05 mm. Winged females, 2.77 mm. to 2.94 mm. long; width across head .630 mm.; greatest width across thorax .924 mm.

Color: Wingless forms yellowish to yellowish brown, the dorsal surface with markings of brown or reddish brown. Venter and legs yellow to whitish. The abdomen with strongly impressed dark reddish brown pleural stripe that is more or less broken on its caudal half. The head marked with two slender brown median longitudinal lines that fuse shortly before the level of the ocellar spots which, in the winged forms are large and black and lie along the inner border of the ocelli. In addition, there are three pairs of dark setiferous spots, two of which are on the front and one pair behind the ocellar spots as in the other species of Mesovelia. The pattern of the winged forms is similar to that of **Mesovelia mulsanti.** The three winged specimens before me have the anterior lobe of the pronotum yellow, marked by a pair of deeply impressed oblique brown lines; the posterior lobe darker, with a median longitudinal yellow line. The anterior lobe of the scutellum with a complete submarginal depressed U-shaped brown band. The hemelytra have three closed cells as in **M. mulsanti** B. white.

Structural characteristics: Eyes normal in size. Interocular space : width of the head across the eyes : : 13 : 31. Therefore the interocular space is plainly less than half the diameter of the head. The antennae slender, the



TEXT FIGURE
Mesovelia thomasi Hungerford—male

1. Dorsal view of genital segments. 2. Left clasper. 3. Side view of genital segments. 4. Ventral view of genital segments.

segmental formula being 1st : 2nd : 3rd : 4th : : 23 : 18 : 30 : 30. The beak attaining the middle of the hind coxae in the males, a little shorter in the females. The anterior femur with one or two black spines on the ventral side, the middle femur with from five to seven black spines on the ventral side. The comparative lengths of the leg segments of the male holotype follow:

	Femur	Tibia	Tarsus
Front leg	105	92	38
Middle leg	139	130	58
Hind leg	182	218	73

Tarsi three-segmented, the first segment very short. In the front tarsus the third segment is about as long as the first two together. In the middle and hind tarsi the second segment is longer than the third.

The males have no spines on the caudal margin of the penultimate ventral abdominal segment (sixth abdominal sternite) such as are present in **Mesovelia bila** Jaczewski. In ventral view, the first genital of the male shows a broad median longitudinal keel and in the depressed area on either side is a field of scattered short dark spines. The lateral margin of the depressed areas bordered with long white hairs. The claspers or parameres as shown in figure 1. Other drawings are presented to assist in the recognition of this species.

Comparative notes: This little species is smaller than **Mesovelia mulsanti** B. White and **Mesovelia hambletoni** D. & H. but the presence of three closed cells in the hemelytron (and the spines on the front and middle femora) indicate its closer relation to them than to **Mesovelia amoena** Uhler which has only two closed cells and lacks the spines on the front and middle femora. In 1941 Harris and Drake[1] described **Mesovelia zeteki** from Panama. They had a single winged male which is about the size of this new species. In **M. zeteki** the "penultimate segment" is "broadly angularly produced behind, beset along the margin with dark fuscous bristly hairs." This is not true for **Mesovelia thomasi.**

In 1949 Drake[2] described **Mesovelia blissa** from the Canal Zone, Panama, using a single macropterous male. The description is short and inadequate, yet the following quotation would indicate a species different from the one I am describing: "First genital segment impressed behind, tumid near base, with small tubercle in middle, there and on each side with small tufts of dark fuscous spines; later pair placed on edge of raised lateral margins of lateral areas; when viewed laterally, the median tubercle and small tuft of dark hairs form a spine-like process and which is directed slightly posteriorly." **Mesovelia thomasi** has neither "tufts" nor the "small median tubercle."

Location of types: Holotype, winged male; allotype, winged female, and one apterous male paratype from "Tuxtla Gutierrez, Chiapas, Mexico, June 27, 1937, H. D. Thomas." Other paratypes as follows: 1 winged female, 4 apterous males and 6 apterous females from "Gualan, Gta." The type series is in the Frances Huntington Snow Collections at the University of Kansas.

[1]Iowa State College Journal of Science XV, No. 3, pp. 275-277.
[2]Boletin de Entomologia Venezolana VII, p. 146.

THE LECTOTYPE AND ALLOTYPE OF HOLOPOGON SNOWI Back (Diptera: Asilidae).

CHAS. H. MARTIN
Oregon State College, Corvallis

Holopogon snowi Back

Holopogon snowi Back. Trans. Amer. Ent. Soc., XXXV: 316-317. 1909.
Holopogon snowi Bromley. Annals Ent. Soc. Amer., XXVII: 98. 1934.

Recently Dr. R. H. Beamer sent to the writer a male specimen of **Holopogon snowi** Back with the label "Clark Co. Ks. May 1692 ft. F. H. Snow". Back described two female specimens with the same label except the elevation was published as 1692 ft. The data on the label of one of the cotypes, kindly loaned by Dr. Beamer, are the same as those on the pin of the male. Apparently the male and the two females were collected in the same locality but Back did not receive the male for description.

Female: All details of Back's description agree with the cotype at hand with these exceptions: Femora polished dark reddish brown; tibiae and tarsi yellow rather than dark reddish; apex of hind tibiae dorsally light chestnut brown fading into the yellow base, yellow below.

Male: Length, 6 mm. Head, black brown, face and front densely brownish yellow pollinose from side view, from above front dark brownish; occiput and posterior side of ocellar tubercle shining brownish black; proboscis and palpi shining brownish black. Beard white, brownish black at corners; mystax white below and black above, mixed black and white in center; hairs of front, upper half of occiput, bristles on antennae, brownish black; hair of ocellar tubercle, lower occiput, proboscis, white. First and second antennal segments and style brown, third segment black; first two segments equal length, third slightly longer than combined length of first two, style slightly longer than first segment.

Thoracic notum black, from side view broad median light brown pollinose stripe extending beyond transverse suture, from above stripe is faint. The pruinose spot on each side of thoracic dorsum, including the humerus and extending toward the median stripe and backward to the transverse suture, grey with brown mesal margin; metanotum polished. Pleurae brown pollinose above and grey below. Hair on mesonotum white to transverse suture, brown posteriorly. Mixed light brown and white pile covering scutellum.

Abdomen shining black, dorsum covered with sparse, recumbent brown pile which is longer than on female, tufts of white pile on first and second abdominal segments three to four times as long as brown pile along margins of remaining abdominal segments; long white pile on venter.

Coxae grey pollinose; femora polished black reddish brown; tibiae and tarsi wholly yellow. Pile and rather weak bristles on all femora white except few dark bristles at apex of hind femora, long, weak bristles on four anterior tibiae black or white, bristles on hind tibiae and all tarsi black, short, thick yellow pile on mesal lower two-thirds of hind tibiae. Tarsal claws black, base yellowish red; pulvilli sordid white.

Wings hyaline, veins yellowish brown; furcation of third vein beyond base of second posterior cell, anterior crossvein slightly before middle of distance between base of second posterior cell and apex of discal cell.

Lectotype, female, Clark Co. Ks. May 1962 ft. F. H. Snow; pin bears a M.A.C. cotype label with the data **"Holopogon snowi** Back". Allotype, male, Clark Co. Ks. May 1962 ft. F. H. Snow. These types are in the Snow Entomological Collections.

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